

CLAIMS

What is claimed is:

1. A refrigeration merchandiser comprising:
at least one surface at least partially defining an environmental space adapted to accommodate a commodity;
a linear compressor, a condenser, an expansion device, and an evaporator in fluid communication, the evaporator being in thermal communication with the environmental space to influence the temperature of the environmental space; and
a frame supporting the at least one surface, the linear compressor, the condenser, the expansion device, and the evaporator.
2. A merchandiser as set forth in claim 1 wherein the frame comprises the at least one surface.
3. A merchandiser as set forth in claim 1 wherein the merchandiser further comprises a display fixture comprising the at least one surface and defining the environmental space.
4. A merchandiser as set forth in claim 3 wherein the frame comprises the display fixture.
5. A merchandiser as set forth in claim 3 wherein the environmental space is a permanently open space.
6. A merchandiser as set forth in claim 3 wherein at least a portion of the at least one surface is translucent.
7. A merchandiser as set forth in claim 1 wherein the linear compressor comprises a free-piston linear compressor.
8. A merchandiser as set forth in claim 7 wherein the free-piston linear compressor comprises dual-opposing pistons.

9. A merchandiser as set forth in claim 1 wherein the merchandiser further comprises a fluid-input line and a fluid-output line, both of which being supported by the frame, wherein the condenser comprises a fluid-cooled condenser, and wherein the fluid input line, the fluid-cooled condenser, and the fluid-output line are all in fluid communication.
10. A merchandiser as set forth in claim 9, wherein the controller comprises a fluid-cooled controller, and wherein the fluid-input line, the fluid-cooled controller, and the fluid-output line are all in fluid communication.
11. A merchandiser as set forth in claim 9, wherein the linear compressor comprises a fluid-cooled linear compressor, and wherein the fluid-input line, the fluid-cooled linear compressor, and the fluid-output line are all in fluid communication.
12. A merchandiser as set forth in claim 1 and further comprising a controller to control the operation of the linear compressor.
13. A merchandiser as set forth in claim 12 wherein the merchandiser further comprises a fluid-input line and a fluid-output line, both of which being supported by the frame, wherein the condenser comprises a fluid-cooled condenser, and wherein the fluid-input line, the fluid-cooled condenser, and the fluid-output line are all in fluid communication.
14. A merchandiser as set forth in claim 13 wherein the controller comprises a fluid-cooled controller, and wherein the fluid input line, the fluid-cooled controller, and fluid outlet line are all in fluid communication.
15. A merchandiser as set forth in claim 13 wherein the linear compressor comprises a fluid-cooled compressor, and wherein the fluid-input line, the fluid-cooled linear compressor, and the fluid-outlet line are all in fluid communication.

16. A merchandiser as set forth in claim 12 wherein the controller further controls the operation of the merchandiser including controlling the temperature of the environmental space.

17. A merchandiser as set forth in claim 1 wherein the merchandiser further comprises a controller coupled to the linear compressor, the controller comprising a sensor configured to sense a parameter representative of an operating condition associated with the merchandiser, and wherein the controller is operable to control the linear compressor based at least in part on the sensed parameter.

18. A merchandiser as set forth in claim 17 wherein the controller is further operable to control the expansion device based at least in part on the sensed parameter.

19. A merchandiser as set forth in claim 17 wherein the sensor comprises a pressure sensor, and wherein the sensed parameter comprises a sensed pressure.

20. A merchandiser as set forth in claim 17 wherein the sensor comprises a temperature sensor, and wherein the sensed parameter comprises a sensed temperature.

21. A merchandiser as set forth in claim 17 wherein the linear compressor comprises a piston, and wherein the controller is operable to control the linear compressor by being further operable to control the stroke of the piston based at least in part on the sensed parameter.

22. A merchandiser as set forth in claim 17 wherein the linear compressor comprises a free-piston linear compressor comprising dual-opposing pistons, and wherein the controller is operable to control the linear compressor by being further operable to control the stroke of the pistons for varying the effective displaced volume of refrigerant based at least in part on the sensed parameter.

23. A stand-alone refrigeration merchandiser comprising:
- a display fixture comprising at least one surface at least partially defining an environmental space, the display fixture being adapted to accommodate a commodity in the environmental space;
 - a free-piston linear compressor, a fluid-cooled condenser, an expansion device, and an evaporator in fluid communication, the evaporator being in thermal communication with the environmental space to influence the temperature of the environmental space;
 - a fluid input line and a fluid output line, both of which being in fluid communication with the fluid-cooled condenser; and
 - a frame supporting the display case, the fluid-input line, the fluid-output line, the free-piston linear compressor, the fluid-cooled condenser, the expansion device, and the evaporator.
24. A merchandiser as set forth in claim 23 wherein the frame comprises the display fixture.
25. A merchandiser as set forth in claim 23 wherein the free-piston linear compressor includes dual-opposing pistons.
26. A merchandiser as set forth in claim 23 and further comprising a controller to control the operation of the free-piston linear compressor.
27. A merchandiser as set forth in claim 26 wherein the controller comprises a fluid-cooled controller, and wherein the fluid-input line, the fluid-cooled controller, and the fluid-output line are all in fluid communication.
28. A merchandiser as set forth in claim 27 wherein the free-piston linear compressor comprises a fluid-cooled, free-piston linear compressor, and wherein the fluid-input line, the fluid-cooled, free-piston linear compressor, and the fluid-output line are all in fluid communication.
29. A merchandiser as set forth in claim 27 wherein the controller further controls the operation of the merchandiser including controlling the temperature of the environmental space.

30. A merchandiser as set forth in claim 23 wherein the free-piston linear compressor comprises a fluid-cooled, free-piston linear compressor, and wherein the fluid-input line, the fluid-cooled, free-piston linear compressor, and the fluid-output line are all in fluid communication.

31. A merchandiser as set forth in claim 23 wherein the merchandiser further comprises a controller coupled to the free-piston linear compressor, the controller comprising a sensor configured to sense a parameter representative of an operating condition associated with the merchandiser, and wherein the controller is operable to control the free-piston linear compressor based at least in part on the sensed parameter.

32. A merchandiser as set forth in claim 31 wherein the controller is further operable to control the expansion device based at least in part on the sensed parameter.

33. A merchandiser as set forth in claim 31 wherein the sensor comprises a pressure sensor, and wherein the sensed parameter comprises a sensed pressure.

34. A merchandiser as set forth in claim 31 wherein the sensor comprises a temperature sensor, and wherein the sensed parameter comprises a sensed temperature.

35. A merchandiser as set forth in claim 31 wherein the free-piston linear compressor comprises a piston, and wherein the controller is operable to control the free-piston linear compressor by being further operable to control the stroke of the piston based at least in part on the sensed parameter.

36. A merchandiser as set forth in claim 31 wherein the free-piston linear compressor comprises dual-opposing pistons, and wherein the controller is operable to control the free-piston linear compressor by being further operable to control the stroke of the pistons for varying the effective displaced volume of refrigerant based at least in part on the sensed parameter.

37. A refrigeration merchandiser comprising:
- a display fixture comprising at least one surface at least partially defining an environmental space, the display fixture being adapted to accommodate a commodity in the environmental space;
 - a frame supporting the display fixture; and
 - a free-piston linear compressor, a condenser, an expansion device, and an evaporator in fluid communication, the evaporator being in thermal communication with the environmental space to influence the temperature of the environmental space, and at least the free-piston linear compressor and the evaporator being supported by the frame.
38. A merchandiser as set forth in claim 37 wherein the frame further supports the condenser and the expansion device.
39. A merchandiser as set forth in claim 37 wherein the free-piston linear compressor comprises dual-opposing pistons.
40. A merchandiser as set forth in claim 37 wherein the refrigeration system further comprises a fluid-input line and a fluid-output line, both of which being supported by the frame, wherein the condenser comprises a fluid-cooled condenser, and wherein the fluid-input line, fluid-cooled condenser, and fluid output line are all in fluid communication.
41. A merchandiser as set forth in claim 37 and further comprising a controller to control the operation of the linear compressor.
42. A merchandiser as set forth in claim 41 wherein the refrigeration system further comprises a fluid-input line and a fluid-output line, both of which being supported by the frame, wherein the condenser comprises a fluid-cooled condenser, and wherein the fluid-input line, fluid-cooled condenser, and fluid-output line are all in fluid communication.

43. A merchandiser as set forth in claim 37 wherein the merchandiser further comprises a controller coupled to the free-piston linear compressor, the controller comprising a sensor configured to sense a parameter representative of an operating condition associated with the merchandiser, and wherein the controller is operable to control the free-piston linear compressor based at least in part on the sensed parameter.

44. A merchandiser as set forth in claim 43 wherein the controller is further operable to control the expansion device based at least in part on the sensed parameter.

45. A merchandiser as set forth in claim 43 wherein the sensor comprises a pressure sensor, and wherein the sensed parameter comprises a sensed pressure.

46. A merchandiser as set forth in claim 43 wherein the sensor comprises a temperature sensor, and wherein the sensed parameter comprises a sensed temperature.

47. A merchandiser as set forth in claim 43 wherein the linear compressor comprises a piston, and wherein the controller is operable to control the linear compressor by being further operable to control the stroke of the piston based at least in part on the sensed parameter.

48. A merchandiser as set forth in claim 43 wherein the free-piston linear compressor comprises dual-opposing pistons, and wherein the controller is operable to control the free-piston linear compressor by being further operable to control the stroke of the pistons for varying the effective displaced volume of refrigerant based at least in part on the sensed parameter.

49. A refrigeration unit comprising:
at least one surface at least partially defining an environmental space;
a linear compressor, a fluid-cooled condenser, an expansion device, and an evaporator in fluid communication, the evaporator being in thermal communication with the environmental space to influence the temperature of the environmental space;
a fluid-input line and a fluid-output line, both of which being in fluid communication with the fluid-cooled condenser; and
a frame supporting the at least one surface, the fluid-input line, the fluid-output line, the compressor, the fluid-cooled condenser, the expansion device, and the evaporator.
50. A refrigeration unit as set forth in claim 49 wherein the frame comprises the at least one surface.
51. A refrigeration unit as set forth in claim 49 wherein the linear compressor comprises a free-piston linear compressor.
52. A refrigeration unit as set forth in claim 51 wherein the free-piston linear compressor includes dual-opposing pistons.
53. A refrigeration unit as set forth in claim 49 and further comprising a controller to control the operation of the linear compressor.
54. A refrigeration unit as set forth in claim 53 wherein the controller comprises a fluid-cooled controller, and wherein the fluid-input line, the fluid-cooled controller, and the fluid-output line are all in fluid communication.
55. A refrigeration unit as set forth in claim 54 wherein the linear compressor comprises a fluid-cooled linear compressor, and wherein the fluid-input line, the fluid-cooled linear compressor, and the fluid-output line are all in fluid communication.

56. A refrigeration unit as set forth in claim 55 wherein the linear compressor comprises a fluid-cooled linear compressor, and wherein the fluid-input line, the fluid-cooled linear compressor, and the fluid-output line are all in fluid communication.

57. A refrigeration unit as set forth in claim 49 wherein the merchandiser further comprises a controller coupled to the linear compressor, the controller comprising a sensor configured to sense a parameter representative of an operating condition associated with the merchandiser, and wherein the controller is operable to control the linear compressor based at least in part on the sensed parameter.

58. A refrigeration unit as set forth in claim 57 wherein the controller is further operable to control the expansion device based at least in part on the sensed parameter.

59. A refrigeration unit as set forth in claim 57 wherein the sensor comprises a pressure sensor, and wherein the sensed parameter comprises a sensed pressure.

60. A refrigeration unit as set forth in claim 57 wherein the sensor comprises a temperature sensor, and wherein the sensed parameter comprises a sensed temperature.

61. A refrigeration unit as set forth in claim 57 wherein the linear compressor comprises a piston, and wherein the controller is operable to control the linear compressor by being further operable to control the stroke of the piston based at least in part on the sensed parameter.

62. A refrigeration unit as set forth in claim 57 wherein the linear compressor comprises a free-piston linear compressor comprising dual-opposing pistons, and wherein the controller is operable to control the linear compressor by being further operable to control the stroke of the pistons for varying the effective displaced volume of refrigerant based at least in part on the sensed parameter.